Clean Energy Literacy and Leadership: Engaging Youth In or After School
Nava, R., Cannady, M. A., Romero, V., Cuff, K., & Dorph, R.

Abstract
This poster describes the variations in outcomes of a university-based outreach program that was implemented either during the school day, where participation is more or less assigned, or afterschool, where participation is self-selected. In both implementation settings, students learned about critical environmental issues and engaged in hands-on, inquiry- and materials-based activities that familiarized them with key science and engineering practices. However, the program implementation varied across settings, due, in part, to student expectations and support from school faculty. While we found no difference in gains in any of our survey measures (values, competency beliefs, career affinity) students were much more likely to attend the in-school program and express appreciation for participation. Schedule of the instructional approach.

Research Questions
What does program implementation look like?
- How was the program different/similar in the two settings?
- How does the intervention experience differ for participants who are recruited through different strategies?
- Is there variation in impact related to student preparation and career trajectory as a result of the implementation of the program?

Learning Environment
Energy and Climate Change
Lead Levels in Soil
Air Quality in Community

In-School
After-School

2-3 sessions/week; 60-90 min. each

Schedule
Participation
Support from classroom teacher
Autonomy of CELL instructor
Context Setting prior to start of program
Graded

Data Collection and Analysis

Data Collection:
- Surveys
  - Science Value
  - Competency Belief
  - Career Affinity
- Interviews
  - Focal Students
  - Student Groups
  - Classroom Instructors

Data Analysis:
- Triangulation of:
  - Pre/Post Paired Sample T-tests
  - Different Coding of
    - Interview data
    - Program observation data

Results
My parents read the news all the time about climate change and about how like the air pollution is getting worse...so I think the program kind of helped me learn more about the stuff that even my parents are learning about. - In school student

Mean Difference in Outcome Variables between Implementation Settings

Data provided by student in school and after school on the program.

Key Takeaways
- CELL provided positive learning experiences that challenged notions and ways of relating to science.
- Students appreciated: 1) hands-on activities, 2) relevance of investigations to self and community.
- Very low participation in the afterschool setting.
- Little difference in the impacts between the settings.

References

Contact us
Rosalinda Nava: rnava920@berkeley.edu
Matthew A. Cannady: mcannady@berkeley.edu
Valeria Romero: valeriafr@berkeley.edu
Kevin Cuff: kcuff@berkeley.edu
Rena Dorph: rdorph@berkeley.edu

This material is based upon work supported by the National Science Foundation under Grant No.1433552. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
MATERIALS & PROCEDURES

**MATERIALS:**
- 2 1x1m pieces of plywood
- Pitching machine
- 4 new baseballs
- Batting cage
- 1 piece of 1x1m Styrofoam
- Tape measure
- Video camera
- Digital camera
- Radar gun
- 50 green garage sale labels
- Tripod
- 2 clamps
- 1x1m thick piece of wood
- Sharpie marker
- 1 piece of 1x1m foam core
- Roll of duct tape
- 2 tubes of epoxy adhesive

**PROCEDURE:**
1. Dust tape 1x1m sheet of foam core to 1x1m piece of plywood
2. Attach the 1x1m piece of Styrofoam to the 1x1m piece of ply wood using epoxy
3. Place pitching machine 18.44 m (60ft 6in) away from backstop
4. Plug extension cord into outlet and machine and adjust machine for straight accuracy
5. Set dials to 97-101 (60-63 mph) kilometers per hour as verified by radar gun
6. Set up video camera on tripod behind the pitching machine
7. Make a 1 cm slice at 0.5 centimeters away from the stitches of 2 separate baseballs
8. Place an unmarred baseball into the machine at 97-101 kilometers per hour and mark the point of impact (ball must be placed in machine same way each time)
9. Do step 8 a total of 25 times with the unmarred baseball
10. Do step 8 a total of 25 times with the cut baseball
11. Change backstop and record impact points
12. Increase speed to 153-157 kilometers per hour (95-98 mph) and repeat steps 9&10

**RESULTS**

Summarize your results in a few sentences.
You should get this information mainly from paragraphs/sections 5 and 6 of your Results section in your final report. But don’t copy/paste whole paragraphs! Hit the main points.

To personalize this poster further, change the background and font colors. To explore new backgrounds, go to SLIDE>Background or SLIDE>Change Theme. There, you can try different color schemes until you find the one you think works best. Remember to keep the contrast high between background color and font color, and stick with one font color throughout the poster, to make for easier reading. Also avoid neon colors that can make viewing the poster uncomfortable or unpleasant.

**CONCLUSIONS**

Summarize your conclusions in a few sentences.
You should get this information mostly from paragraphs 2, 3 and 5 of the Conclusions section of your final report. But don’t copy/paste whole paragraphs! Hit the main points.

You can also discuss a few of the important scientific concepts you have come to understand better, now that you’ve reflected upon your data and your project as a whole.

**DATA & VISUALS**

YOUR DATA AND VISUALS GO IN THIS MIDDLE SECTION.
Include several photos, diagrams, charts, graphs, tables in this area, with captions and photo credits.

To add images to your poster from your computer: Go to INSERT > IMAGE > CHOOSE AN IMAGE TO UPLOAD DON’T use the COPY- PASTE command - it can cause problems.

**REMEMBER! EACH PHOTO/IMAGE MUST HAVE A CAPTION CREDITING ITS AUTHOR.** Use a small font size for the credits.

**SCALING IMAGES:** Be careful when enlarging images on your poster by grabbing and dragging the corner. Scaling an image more than three times its original size may make it look fuzzy and unappealing.

See the examples in Figure 10 below. They look okay, right? But what happens when they’re printed at poster size? Go to the Zoom command (in the View menu) and choose 100% or 200%. Now look at the images again. See all the jagged edges? That’s called PIXELIZATION. It doesn’t look good, and it will detract from the look of your poster.

To have good-looking images on your poster, use the largest images you can. You can tell how large the image is by looking at the file size. Also, be VERY wary of images downloaded from the Web: they’ll probably be small files of less than 100kb, and they won’t look good when blown up to poster size.

**TO IMPORT TABLES & CHARTS**
- From Excel: Go to INSERT > IMAGE > CHOOSE AN IMAGE TO UPLOAD DON’T use the COPY- PASTE command - it can cause problems.
- From Google Spreadsheets: Go to the file tab, then click on “Download as” and then “CSV”.

You can also discuss a few of the important scientific concepts you have come to understand better, now that you’ve reflected upon your data and your project as a whole.